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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/776,228	02/12/2004	Je Won Kim	2336-241	2636

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EXAMINER	
MULPURI, SAVITRI	

ART UNIT	PAPER NUMBER
2812	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/776,228

Applicant(s)

KIM ET AL.

Examiner

Savitri Mulpuri

Art Unit

2812

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 July 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-10 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This action is in response to the applicant's communication Affidavits and arguments filed on 7/20/2007.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2-5, 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Orita et al (US 6,673,702) in combination with Nakamura et al (US 5,578,839)

Orita et al teaches growing GaN buffer layer on either sapphire substrate; treating the buffer layer in hydrogen atmosphere or hydrogen gas mixed with other gases in MOCVD, at temperature of 500- 900 °C, to remove oxide layer (see col. 4, lines 39-47; col. 7, lines 1-30); successively growing first GaN based layer, active GaN based layer and second GaN based layer on the buffer layer (see 7C). Orita et al also teaches growing first active and second GaN based layers in MOVPE or HVPE. Though Orita et al teaches both HVPE and MOCVD for both buffer layer and active layers, Orita et al does not teach specifically which layer is grown by what technique. However, it is well known that HVPE give fast growth rate with low quality GaN layer and MOCVD give low growth rate and high quality and it is obvious to one of the ordinary skill in the art to grow buffer layer in HVPE at fast growth to get thick buffer

layer and active layer in MOCVD with slow growth rate and thin layers for light emission. Using thick layer is essential as buffer layer because thick layer are useful not to cause any defects in the subsequent device layers.

Orita et al do not teach forming buffer layer being undoped buffer layer.

Nakamura et al teaches GaN based undoped buffer layer on the substrate and then successively growing lower clad layer "16" and active layer "16" and upper clad layer "20" on the undoped buffer layer "14" (see fig 1 and col. 5, lines 65-67, col. 6, lines 5-21). It would have been obvious to one of ordinary skill in the art to form undoped buffer layer in the invention Orita et al because undoped buffer layer can be useful as insulating layer between the active layers by providing good isolation, and undoped buffer layer would not have problem of out diffusion of the dopants into the active layer because the buffer layer is undoped layer.

Heat-treating step in different ambient hydrogen containing gas such as hydrogen or ammonia or nitrogen at different temperature ranges depending on the ambient but do not teach an additional heat-treating step. However, The transposition of process steps or the splitting of one steps into two, where the Processes are substantially identical or equivalent in terms of function, manner and result was held not to patentably distinguish the processes Ex parte Ruben 128 USPQ 440. Since the claims 7-8 heat treating step for step C is 800 C, step C' is anywhere between 150-1000 C, Heat treating step at same temperature can be split into steps first using hydrogen gas and then switch to ammonia or nitrogen to obtain removing oxide and then improve the surface condition of the nitride semiconductor

crystal film in a state where the oxide film is removed therefrom. It is well known the heat treatment in ammonia or nitrogen improves the surface quality by replenishing the nitrogen element, which is lost from the surface during the previous heat treatment.

In any case, as reasoned from well established legal precedent, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to split the heat treating step in Orita et al into two heat treating steps because applicant has not disclosed that the limitation is for a particular unobvious purpose, produces an unexpected result, or is otherwise critical, and it appears prima facie that the process would possess utility using multiple steps. Moreover, it has been held that the splitting of one step into two, where the processes are substantially identical or equivalent in terms of function, manner and result, is prima facie obvious absent a disclosure that the limitation is for a particular unobvious purpose, produces an unexpected result, or is otherwise critical. *Ex parte Ruben* 128 USPQ 159. Furthermore, it is well established that mere repetition or duplication to accomplish an expected additive function or result is prima facie obvious absent a disclosure that the repetition or duplication is for a particular **unobvious** purpose, produces an unexpected result, or is otherwise critical. See, for example, *In re Ockert*, 114 USPQ 330 (CCPA 1957); *In re Schuelke*, 96 USPQ 421 (CCPA 1953); *In re Hertrich*, 73 USPQ 442 (CCPA 1947); *Long Mfg. N.C., Inc. v. Condec Corp.*, 223 USPQ 1213 (DC ENC 1984); *St. Regis Paper Company v. Bemis Company, Inc.*, 193 USPQ 8 (CA 7 1977); *In re Harza* 124 USPQ 378 (CCPA 1960);

Hofschneider Corp. v. Lane et al., doing business as Lane and Co., 71 USPQ 126 (DC WNY 1946).

It must be noted that the second heat-treating step, in the instant invention, is not crucial for the process because instant invention discloses the second step may be performed, which is interpreted as optional.

Claims 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Orita et al in combination with Nakamura et al as applied to claims 2-5,7-15,17-21 above, and further in view of Lee et al.

Orita et al do not teach nitridation of the substrate. Lee teaches nitridation of the substrate. It would have been obvious to one of ordinary skill in the art to perform nitridation on the substrate prior to growing GaN based layer because such nitridation gives high quality nitride based semiconductor layers.

Response to Arguments

Applicant's arguments filed 7/20/2007 have been fully considered but they are not persuasive. Applicant argues that Orita uses heat treatment process to remove oxide. However, Orita uses hydrogen or ammonia or nitrogen during heat treatment, and, as explained above, Ex parte Ruben 128 USPQ 159, the heat treatment process can be split into two steps, partly in hydrogen to remove oxide and partly in ammonia or nitrogen to improve the surface condition because as is well known ammonia or nitrogen improving the surface quality to replenish the nitrogen element lost from the surface during the previous heat treatment.

Applicant argues that Orita teaches using buffer layer is doped but not undoped. However, Nakamura teaches undoped buffer layer for good isolation of active layer from the substrate.

Conclusion

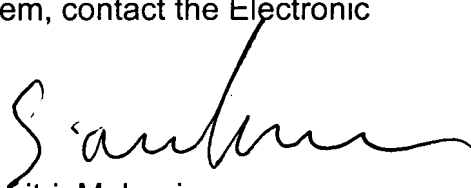
THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Savitri Mulpuri whose telephone number is 571-272-1677. The examiner can normally be reached on Mon-FRi from 8 a.m. to 4.30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt, can be reached on 571-272-1873 The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2812

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Savitri Mulpuri
Primary Examiner
Art Unit 2812